

# Department of Mathematics—Philadelphia University

## Course Syllabus

Course Title	Abstract Algebra 1
Course Code	250342
Semester	Second/2022–2023
Lecturer	Amin Witno
Office Room	814 Faculty of Science
Office Hours	Sun/Tue: 09:30–11:00; Mon/Wed: 11:00–12:30
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## Short Description

This module is the first part of the Abstract Algebra two-semester series, covering standard topics in group theory: the modular integers, cyclic groups, normal subgroups, isomorphisms, permutation groups, finite abelian groups, and if time permits, some Sylow theorems.

## Topics by the Week

1. Introduction to groups, definition, examples
2. The group of modular integers  $Z_n$ , the group of units  $U_n$
3. Subgroups, the two-step and one-step subgroup tests, the centralizer and the center of a group
4. Cyclic groups, subgroups of a cyclic group, the subgroups of  $Z$
5. Cosets, Lagrange's theorem, order of elements, Euler's theorem
6. Subgroups of finite cyclic groups, subgroup lattice of  $Z_n$
7. Normal subgroups and factor groups
8. Group homomorphism, the kernel of a homomorphism, isomorphism
9. The fundamental homomorphism theorem for groups, the Chinese remainder theorem
10. Classification of finite abelian groups, Cauchy's theorem for abelian groups
11. Permutation groups, even and odd cycles, the alternating subgroups of  $S_n$
12. The dihedral groups, finite groups of order  $2p$
13. Orbits and stabilizers
14. Review for Final Exam.

## Lecture Notes

There are two revision notes relevant to this course:

1. *From Groups to Galois*. Students are required to download a softcopy of these notes for free from the online course page. We will cover only Chapters 1 to 13, while the rest of the notes will be used for Abstract Algebra 2.
2. *Finite Abelian Groups*. These notes are a supplement to the lecture notes, to be used when we discuss Chapter 10—also available from the website.

The above materials can be obtained via the link below.

<http://witno.com/philadelphia/notes.htm>

## Recommended Textbooks

Students who wish to consult an Abstract Algebra textbook can do so by visiting our main library. The following titles are highly recommended.

1. Joseph A. Gallian, *Contemporary Abstract Algebra*, Tenth Edition 2021, CRC Press.
2. I. N. Herstein, *Topics in Algebra*, Second Edition 1975, Wiley.

## Online Resources

The following shortcut will take you to my web homepage at the University, where you find the course syllabus, lecture slides, exam dates, copies of old exams, links to the above materials, and any important announcement related to the current semester.

<http://phi.witno.com>

## Grade Distribution

Homeworks	
Quizzes	30%
Class participation	
Midterm Exam	30%
Final Exam	40%

## Exam Dates

Exam dates, once determined, will be posted online at the homepage as well as at the University student-portal page.

## Homework Exercises

Homework exercises and lecture slides have been uploaded to the Moodle coursepage as well as at the MicroSoft Teams channel.

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